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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/451,108	11/30/1999	WANG RAE KIM	K-119	8600

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EXAMINER
KUMAR, PANKAJ

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 08/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	09/451,108	KIM, WANG RAE	
	Examiner	Art Unit	
	Pankaj Kumar	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-9,12-15 and 19 is/are rejected.

7)☒ Claim(s) 10,11 and 16-18 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because it may be too long. The abstract must be between 50 and 150 words. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-9 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Kumar et al. USPN 5852389.

4. As per claim 1, Kumar teaches a vector modulator (Kumar fig. 1B), comprising: a first amplitude invariant (inherent for a good phase shifter to be amplitude invariant) phase shifter (Kumar "Phase shifters, for example implemented using Lange couplers terminated with varactor

diodes, are connected to the output ports of the Lange couplers for compensating phase shifts caused by the different levels of the attenuators."; fig. 1A: 11 is a coupler onto which phase shifters can be attached based on quote above) to shift a phase of an input signal (inherent for a phase shifter to do so); a coupler to separate an output of the first amplitude invariant phase shifter into first and second channel signals (Kumar fig. 1A: 11); a second amplitude invariant phase shifter to shift a phase of the first channel signal (Kumar fig. 1B: 18); a third amplitude invariant phase shifter to shift a phase of the second channel signal (Kumar fig. 1B: 19); and a combiner that receives and combines signals from the second and third invariant phase shifters and provides an output (Kumar fig. 1B: 20).

5. As per claim 2, Kumar teaches the vector modulator of claim 1, wherein the coupler (Kumar fig. 1A: 11) is quadrature (Kumar fig. 1A: 11 has outputs 0 and –90 which are in quadrature) hybrid coupler selected from one of a branch line, a Lange coupler (Kumar fig. 1A: 11 states it is a Lange coupler), and a Wilkinson divider.

6. As per claim 3, Kumar teaches the vector modulator of claim 1, wherein the first amplitude invariant phase shifter delays the input signal by fixed intervals within a first prescribed shifting range of approximately 0° --360° (Kumar fig. 1A: 11 shifts between 0 and 90 degrees which is within the range of 0 to -360; 11 combined with 12 and 13 shift first between 0 and -90 and then between 0 and -180).

7. As per claim 4, Kumar teaches the vector modulator of claim 1, wherein the second amplitude invariant phase shifter delays the first channel signal by a prescribed phase within a variable phase range of approximately 0° --90° (Kumar fig. 1B: 18 shifts between 0 and 40 degrees based on quote).

8. As per claim 5, Kumar teaches the vector modulator of claim 1, wherein the third amplitude invariant phase shifter delays the second channel signal by a prescribed phase within a variable phase range of approximately 0° --- 90° (Kumar fig. 1B: 19 shifts between 0 and 40 degrees based on quote).

9. As per claim 6, Kumar teaches the vector modulator of claim 1, wherein each of the first, second and third amplitude invariant phase shifters is a reflection type amplitude invariant phase shifter (Kumar "(11) In the preferred implementation of the variable attenuator, the output 35d of the Lange coupler 35 feeds the input 38a of a variable ***phase shifter 18*** implemented with a Lange coupler 36 having two reflection ports 38b, 38c and an output 38d. The shifter 18 is preferably a reflection type phase shifter on microstrip using two varactor diodes 31 and 32 (Alpha 120412) at the reflection ports 18b, 18c and a Lange coupler 36 similar to coupler 11. The attenuation variation of this phase shifter is less than 0.25 dB and the return loss is better than 25 dB over the 12 volt varactor bias and 500 MHz bandwidth. The ***phase shifter 18 offers a 40 degree phase shift over the varactor bias voltage range***. The block 39 also provides the required control signal voltages at input 31a, 32a for varactor diodes 31 and 32 to compensate for the phase shift error of different levels of attenuator 16 corresponding to the baseband PAM. ***Similarly, the phase shifter 19*** uses a Lange coupler 38 and two varactor diodes 33 and 34 to compensate the phase shift error at different attenuation levels of attenuator 17 using control signals supplied through lines 33a, 34a from the predistortion and prefiltering block 40. The elements in the quadrature path have the same function and design as the corresponding elements in the in phase path. ").

10. As per claim 7, Kumar teaches the vector modulator of claim 6, wherein each of the first, second and third amplitude invariant phase shifters includes at least one PIN diode (Kumar "The variable attenuators preferably each comprise a Lange coupler whose reflection ports are terminated in forward biased PIN diodes.") and a hybrid coupler (Kumar "The circuit implementation of a 64QAM modulator according to the present invention is shown in the attached FIGS. 1, 1A and 1B. As shown in this figure, the radio frequency output signal of the high power oscillator 10 is divided into in phase and quadrature components using a hybrid Lange coupler 11 to obtain the required signals."; 35,36,37,and 38 in fig. 1B also are hybrid since they have 0 degree and –90 degree phases).

11. As per claim 9, Kumar teaches the vector modulator of claim 6, wherein each of the first, second and third amplitude invariant phase shifters includes at least one PIN diode (Kumar "The variable attenuators preferably each comprise a Lange coupler whose reflection ports are terminated in forward biased PIN diodes.") and a circulator (Kumar "Using a circulator and a control switch, it is possible to realize a reflection type phase shifter . However, the preferred implementation described offers wider bandwidth when compared with the delay line and a simpler circuit when compared with the circulator phase shifter .").

12. As per claim 12, Kumar teaches the vector modulator of claim 1, wherein the first channel signal is an I channel signal and the second channel signal is a Q channel signal that is phase shifted approximately 90° from the I channel signal (Kumar "the radio frequency output signal of the high power oscillator 10 is divided into in phase and quadrature components using a hybrid Lange coupler 11 to obtain the required signals. This Lange coupler 11 has an insertion

loss of 3.+-.0.1 dB, a return loss of 24.+-.3 dB, and a phase difference between output ports is close to 90 degree over 500 MHz bandwidth.").

13. Claims 13, 14 are discussed in claims 1-9 and 12 above.

14. Claims 15, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Belcher USPN 5760646.

15. As per claim 15, Belcher teaches a circuit for a high power amplifier (Belcher Field of Invention: " ... adaptive RF power amplifier ... "), comprising: a divider (Belcher fig. 2: 101) to divide an input signal into a first signal (Belcher fig. 2: 105) and a second signal (Belcher fig. 2: 107); a vector modulator (Belcher fig. 2: 110) to receive the first signal (Belcher fig. 2: 111 is a modified version of 105) and a control signal (Belcher fig. 2: 113 is a modified version of 107) and output a vector modulated signal (Belcher fig. 2: output of 110); an amplifier to amplify the vector modulated signal (Belcher fig. 2: 116); a directional coupler (Belcher fig. 2: 123) to receive a signal from the amplifier and generate a reference signal; and a fast phase-amplitude controller (Belcher fig. 2: 180) to compare amplitudes and phases of the reference signal (Belcher fig. 2: input 181) and the second signal (Belcher fig. 2: 107) delayed for a prescribed time period (inherent for various components to cause delay), to provide the control signal.

16. As per claim 19, Belcher teaches the circuit of claim 15, wherein the vector modulated signal has a phase in the range of 0 ---360° in a polar coordinate system (inherent in Belcher since there is no phase limitation for fig. 2 110).

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

18. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar.

19. As per claim 8, Kumar teaches the vector modulator of claim 6, wherein each of the first, second and third amplitude invariant phase shifters includes at least a hybrid coupler (Kumar "The circuit implementation of a 64QAM modulator according to the present invention is shown in the attached FIGS. 1, 1A and 1B. As shown in this figure, the radio frequency output signal of the high power oscillator 10 is divided into in phase and quadrature components using a hybrid Lange coupler 11 to obtain the required signals."; 35,36,37,and 38 in fig. 1B also are hybrid since they have 0 degree and –90 degree phases). What Kumar does not show is one varactor diode for one of the amplitude invariant phase shifters; however, Kumar does show varactor diodes for the remaining amplitude invariant phase shifters (Kumar fig. 1B shows varactor diodes 27-34 but fig. 1A does not show any varactor diodes.) It would have been obvious to one skilled in the art at the time of the invention to modify Kumar to show one more varactor diode with the remaining amplitude invariant phase shifter. One would be motivated to do so for "for compensating phase shifts caused by the different levels of the attenuators" as taught in Kumar.

Allowable Subject Matter

20. Claims 10, 11, 16, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. The following is a statement of reasons for the indication of allowable subject matter: The art of record does not suggest the respective claim combinations together and nor would the respective claim combinations be obvious with the following underlined portions:

22. As per claim 10, the vector modulator of claim 1, wherein the first, second, and third amplitude invariant phase shifters respectively shift within first (Kumar: 0 degrees), second (Kumar: 90 degrees), and ***third*** (not in Kumar) prescribed shifting ranges.

23. Claim 11 depend on claim 10.

24. As per claim 11, the vector modulator of claim 10, wherein the combiner (Kumar fig. 1B: 20) calculates a vector sum (Kumar fig. 1B: 41), wherein the first amplitude invariant phase shifter delays the input signal by fixed intervals within the first prescribed shifting range (Kumar fig. 1A: 0 and 90 degrees), wherein the second and third amplitude invariant phase shifters delay the first and second channel signals (Kumar : I and Q) by first and second phases (Kumar 0 and 90 degrees) within the second and ***third*** (not in Kumar) prescribed shifting ranges respectively, and wherein the second and ***third*** (not in Kumar) prescribed shifting ranges are variable.

25. As per claim 16, the circuit of claim 15, wherein the vector modulator comprises: a first amplitude invariant phase shifter to shift a phase of the first signal within a first prescribed shifting range; a coupler to separate an output of the first amplitude invariant phase shifter into I and Q channel signals having approximately a 90° phase difference relative to each other; a

second amplitude invariant phase shifter to shift a phase of the first channel signal by a first fixed amplitude within a second prescribed shifting range; a third amplitude invariant phase shifter to shift a phase of the second channel signal by a second fixed amplitude within a ***third*** (not in Kumar or Belcher) prescribed shifting range; and a combiner to receive signals from the second and third invariant phase shifters and calculate a vector sum thereof and generate the vector modulated signal.

26. As per claims 17 and 18, they depend on claim 16.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pankaj Kumar whose telephone number is (703) 305-0194. The examiner can normally be reached on Monday through Thursday after 8AM to after 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi H. Pham can be reached on (703) 305-4378. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3800.

PK
August 21, 2002

CHI PHAM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600 8/22/02